Are there negative returns to aid?

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ARE THERE NEGATIVE RETURNS TO AID?

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SOM-theme E: Financial markets and institutions

ABSTRACT
The World Bank report *Assessing Aid* assumes that aid is more effective when it is given to countries where polices are sound. Moreover, it assumes that an inflow of aid, above a certain level, starts to have negative effects. In this paper we empirically test both assumptions. We do not find evidence for the fact that aid becomes more effective when it is given to countries with good policies. On the other hand, we find some evidence for negative returns to aid at high levels of aid inflows. However, the results are sensitive to the countries considered as well as the exact specification. Moreover, the turning point above which aid starts to have a negative effect on growth seems to be much higher than assumed in the background calculations for *Assessing Aid*

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1. INTRODUCTION

The World Bank report *Assessing Aid* argues that a reallocation of the existing aid flows to poor countries with sound management would lift 18 million more per year out of poverty (World Bank, 1998:16). This figure is based on calculations by Collier and Dollar (1999) who aim to determine a poverty-efficient allocation of aid. Their analysis assumes that aid becomes more effective if it is given to countries with sound policies and that aid, above a certain level of inflows, starts to have negative effects on growth (see Lensink and White, 2000a).

The main aim of this paper is to examine whether empirical evidence supports the notion of negative effects of high aid inflows. In addition, we test whether aid becomes more effective when it is given to countries with good policies. We first document the phenomenon of rising aid levels (Section 2), before going on in Section 3 to present some arguments to illustrate why high levels of aid can be bad for the recipient. The latter notion can be captured in the idea of the aid Laffer curve: that is, the benefits from aid increase with initial inflows but after a certain level begin to decline, so that the country would actually be better off with less aid. In Section 4 we attempt empirical estimation of the aid Laffer curve. Section 5 concludes.

2. THE EMERGENCE OF HIGH AID INFLOWS

During the last two decades aid to some developing countries has grown to very high levels. Whereas in the late 1970s only eight countries had aid to GNP ratios in excess of 20 per cent, and none higher than 50 per cent, by the first half of the 1990s 26 countries had aid ratios of 20 per cent or more, with four countries having ratios greater than 50 per cent. Aid per capita has shown a similar trend, with the number of countries receiving over US$100 per person rising from 19 to 32 from the late 1970s to the early 1990s, 12 countries receiving in excess of $250 per person in the later period compared to five in the earlier.[1] The highest aid recipient in both periods, New Caledonia, saw its aid inflow rise from an average of $670 each year for each person in the 1970s to over US$2,000 a person in the first half of the 1990s. Aid donors worry that such high levels of aid may signify, or induce, aid dependence, rather than lay the basis for self-reliant development as aid is intended to.

Tables 1 and 2 lists those countries having over certain threshold values of aid flows, where aid flows are normalised by both GNP and population. Table 3(a) reports the cumulative distributions from these data. Two features are notable from these data. First, the number of countries receiving aid in excess of the threshold values shown has been increasing over time, with a doubling in the number of countries receiving

aid of $50 or more per capita and a more than threefold increase in those receiving aid equivalent to at least 20 per cent of GNP. Second, there has emerged a group of "very high aid" recipients, receiving more aid per capita than the income per capita levels of many developing countries. For several countries aid is 30 per cent or more of GNP. Whilst none of these countries are large ones, the phenomenon of high aid is by no means restricted to micro-states: countries such as Israel, Mozambique and Nicaragua also feature in the tables.

An alternative presentation of these data is given by Table 3(b), which presents summary statistics of box plots given in an earlier version of this paper (see Lensink and White, 1999). There is clearly a group of very high recipients. At the same time the median aid per capita has drifted up over time (from US$ 11 per person in 1975-79 to US$ 38 in 1990-95): by the later period the upper quartile had reached $80, so that a quarter of developing countries were in receipt of aid in excess of this amount. Whilst the median aid to GNP ratio has not risen in the same way, the upper quartile has moved up, so that over one quarter of countries have aid ratios greater than 15 per cent in the 1990s.

These data thus clearly support both the proposition that a greater number of countries can be classified as high aid recipients in the 1990s than was the case in the 1970s, and that there has emerged a class of very high aid recipients. But do these trends represent a problem? Or will extraordinary aid flows allow their recipients to achieve their development objectives the sooner?

3. THE AID LAFFER CURVE

We do not provide a formal model for the existence of an aid Laffer curve, but offer various reasons as to why it is possibly important.[2] Aid has always had its critics who maintain that it does more harm than good. Milton Friedman supported military aid to defend the "free world", but argued that the case for economic aid was based on three basic propositions that are "at best misleading half-truths" (1958, reprinted in 1970: 67). He objected in particular to the idea that development required comprehensive planning and control by government. Indeed, the contrary was the case - that is, "what is required in the underdeveloped countries is the release of the energies of millions of able, active, and vigorous people, ... [who] only require a favourable economic environment to transform the face of their countries" (*ibid*: 71). Hence aid will "almost surely retard economic development and promote the triumph of Communism" (*ibid*: 64). Peter Bauer has persistently pursued this line of argument over the years; for example:

> .. aid does not descend indiscriminately on the population at large, but goes directly to the government. Because aid accrues to the government it increases its resources, patronage, and power in relation to the rest of society. The resulting politicization of life enhances the hold of government over their subjects and increases the stakes in the struggle for power. This result in turn encourages or even forces people to divert attention, energy and resources from productive economic activities... Foreign aid has also enabled many governments to pursue policies that plainly retard economic growth and exacerbate poverty... (Bauer, 1991: 45-46).

Writers from the left, especially those employing a dependency theory framework, have also been critical. In Andre Gunder Frank's paper entitled Aid or Exploitation? he argued that US assistance was "definitely prejudicial to Brazil" (1963, reprinted in 1969: 160), since it facilitated a net outflow out of the country and allowed the US to direct Brazilian development in a direction beneficial to US interests. Starting with *Aid as Imperialism* (Hayter, 1971), Teresa Hayter has published a series of works examining how aid harms the poor and the environment to the benefit of Western interests and a small minority in developing countries (e.g., Hayter, 1989). Finally, Keith Griffin (1970, and Griffin and Enos, 1970) argued that aid can harm growth, an effect which is produced by a combination of savings displacement and an increase in the incremental capital-output ratio (ICOR) as a result of the lower productivity of aid-financed investment.

We do not pursue these arguments here, although some of them may play some role in explaining why aid's net benefits may become negative at high levels of inflows. Rather we are concerned to explore the possibility that aid may have not merely decreasing returns (a proposition which everyone would surely accept) but that, after a certain level, the returns to further aid inflows are negative. This idea, i.e. that a country can get "too much aid", can be captured in the idea of an aid Laffer curve.

Beneficial effects may of course refer to any of aid's intended beneficial impacts. A review of donor policy statements (see Lensink and White, 1997) shows five themes common to many donors: (1) self-sustaining growth; (2) poverty reduction; (3) environmental sustainability; (4) improving the position of women;[3] and (5) good governance (democratisation etc.). Examination of the aid Laffer curve would require estimation of the link between aid and some output measure related to each of

these objectives. However, in practice we move rapidly into uncharted territory if we attempt an overall assessment of aid's impact in relation to any of these objectives. The most effort has been put into the growth objective, and our empirical estimates in Section 3 relate to this objective. But first we consider reasons as to why an aid Laffer curve may exist.

Griffin (1970) gives a possible reason for the existence of an aid Laffer curve. He argues that aid would reduce the productivity of investment so that, if this effect were sufficiently large, then aid would reduce growth. In addition to Griffin's argument, contributions to the aid effectiveness literature have also pointed to problems of absorptive capacity, which may suggest the inverse relationship between aid and productivity which underlies the theoretical rationale for an aid Laffer curve. Examples of studies finding this phenomenon include:

- Lavy and Sheffer (1991) examine the cases of Egypt, Syria and Jordan which are now worse off, after years of very high aid inflows, than they were in the early 1970s. The story of why this is so is as follow. High aid inflows exceed those which can feasibly be used in profitable investment and so some aid must be consumed. This consumption usually takes the form of consumer subsidies (and perhaps highly subsidised government services). When aid slackens these policies are not readily reversible (a notion economists call hysteresis). If possible, the government will borrow to maintain consumption - which postpones, but exacerbates, the eventual fiscal adjustment. Alternatively, government may print money. These problems are intensified by the fact that aid-financed investments may not have been particularly profitable, and may have discouraged private sector activity.

- Zejan and Kokko's analysis of aid to Guinea-Bissau finds that aid has financed investment, but that "the total investment volume reflects levels of investment which are too high with respect to the country's management capability" (1998: 134).

- Morton draws a similar conclusion from his analysis of Sudan, arguing that donors are unwilling to accept that the poorest developing countries only have the capacity to successfully implement a very limited number of development projects; hence, he says, "the volume of aid just grows and grows without regard for its chances of being put to productive use" (1994: 16).

- Sobhan (e.g. 1996) argues that aid is too high as the recipient government is swamped by donors and so unable to direct its own development effort, to the long run detriment of that development.

- A review by ODC of *Strengthening Aid in Africa* argues that aid has been allocated without regard for absorptive capacity:

> The absorptive capacity of the recipient state, not some arbitrary proportion of GNP of donor countries should determine the level of aid a country receives... Given the low levels of development in most African countries, low domestic savings, low government capacity, and the levels of aid already often well above 10 per cent of GNP, such estimates suggest that many African countries could not absorb much more aid without further drops in long-term effectiveness. (van de Walle and Johnston, 1996: 98).

- Morss (1984) observed what he called "donor proliferation" and how this phenomenon diverted government officials into "pleasing donors" rather than pursuing their country's development objectives.

From these studies a story emerges. There is a limit to how much aid a country can "absorb" (i.e. have the capacity to manage).[4] That fact alone would suggest rapidly diminishing returns to aid. But the situation is worse since the institutional destruction of government's proper functioning as its resources are diverted to managing the burgeoning aid programme means that no aid is used effectively so that the return on aid falls. Moreover, longer-run growth prospects are undermined as government becomes embroiled in a network of aid-financed subsidies.

4. ESTIMATION RESULTS

Here we examine the aid Laffer curve empirically in relation to the growth objective. Growth is chosen since it is a readily available output measure and we can draw on a well-established approach to conduct our analysis. We present the estimation results from growth regressions using the per capita growth of real GDP as the dependent variable. The regression is a pooled cross-section time series analysis, using period averages calculated from three five year periods (1975-79, 1980-84 and 1985-89) and

one three year period (1990-92). The main data source is World Bank (1997), though the dependent variable comes from the Penn World Tables, with our time periods determined by data availability from these sources. The basic panel consists of 138 countries (the countries used in Barro and Lee, 1994), from which we have included only those countries which are aid recipients (see Appendix 1 for a list of countries).[5]

Following the seminal work of Barro (1991), many studies have analysed the determinants of economic growth. These studies report a large number of variables to be correlated with growth. In principle, they could all be taken into account. However, using extreme bound analysis (EBA), Levine and Renelt (1992), show that most of these variables are not robust (i.e. their coefficients and significance can change substantially depending which other variables are included in the estimated equation). Therefore, we use EBA.

In the analysis the following cross-section regression is used:

$$g = \alpha_j + \beta_{ij} I + \beta_{mj} M + \beta_{zj} Z + \mu$$

where g is the per capita growth rate of GDP, I is a set of variables always included in the regressions. M are the variables of interest. In our case, M is the aid/GDP ratio and the aid/GDP ratio squared. Z is a subset of a vector of domestic and international macroeconomic variables identified by past studies as being potentially important explanatory variables of GDP growth.

The estimation procedure starts by determining a reasonable base model in which the quadratic term for the aid/GDP ratio is not yet taken into account. First, we have to decide on the vector of variables I. We take as I variables the initial level of per capita income (*GDPPC*), the initial secondary-school enrolment rate (*SENROLM*), the debt to GDP ratio (*DEBTGDP*), intercept dummies for Sub-Saharan Africa (*DUMSSH*), Latin America (*DUMLA*), Asia (*DUMASIE*) and the different sub-periods (*DUM7579, DUM8084, DUM8589 and DUM9094*, respectively).[6] *GDPPC* is included to account for the conditional convergence effect. The sign is expected to be negative. *SENROLM* proxies for the initial stock of human development. The sign is expected to be positive. *GDPPC* and *SENROLM* are standard variables in recent growth regressions. While *DEBTGDP* is not often included in growth regressions, it is very often a variable of interest in studies on developing countries. Therefore, we have included *DEBTGDP* in the set of I variables. The region dummies are often found to be significant in growth regressions (see Sala-i-Martin, 1997) and are thus included. The intercept dummies for Sub-Saharan Africa and Latin America, unlike

Asia, are expected to be negative.[7] The time dummies are taken into account to correct for possible fixed effects caused by the different sub-periods.

The first estimate we present contains all above mentioned *I* variables as well as the Aid to GNP ratio (*AIDGDP*). The results are given by equation 1 in Table 4. The equation confirms the relevance of the initial level of GDP, the Debt to GDP ratio, quite a few dummies and the secondary enrolment rate for economic growth. This result is in line with theory and hence quite satisfactory. Most importantly, the aid variable is significant and has the expected sign. However, the Jarque-Bera (JB) test shows that the residuals of equation 1 are not normally distributed.[8] Therefore, we reestimated the equations by deleting extreme outliers. The results are given by equation 2 in Table 4. The Jarque-Bera now suggests that the residuals are normally distributed. In the other estimates presented in this paper, we use the data set without the extreme outliers.

Before we add a quadratic term for the aid/GDP ratio we consider two issues which are emphasized in recent growth regressions with aid. First, some studies by Boone (1994, 1996) and a recent study by Burnside and Dollar (1997) suggest that one should instrument the aid/GDP ratio in order to account for the possible endogeneity of aid. Second, Burnside and Dollar (1997) show that foreign aid only significantly affects aid in good policy environments, implying that the aid term should be interacted with a policy variable. We consider both issues in turn.

We first examined whether the aid variable should be instrumented. We estimated different equations for *AIDGNP*, which are presented in Table 5. We regressed *AIDGNP* on all exogenous variables from the base regression (equation 2 in Table 4) in addition to some combination of the size of the population (*POP*), the mortality rate (*MORTAL*), a variable for political rights (*PRIGHTS*), the debt service ratio (*DEBTSERV*) and a variable denoting civil liberties (*CIVIL*). These variables are suggested by other studies as good instruments for AID.[9] Since the fitted value of the different estimates for AIDGNP (FITAIDGNP) is insignificant when it is taken into account as an additional independent variable in the growth regressions, the null is accepted, and hence *AIDGNP* may be considered exogenous.[10] Based on these results we decided not to instrument for *AIDGNP* and perform the rest of the analysis by using the base models without instruments as presented in Table 4.[11]

The next issue we considered is the efficiency of aid in a good policy environment. It has recently been argued in the World Bank report *Assessing Aid* (World Bank, 1998) that aid only works when the policy environment is right: this finding being based on a growth regression in which aid is insignificant but the

interactive variable, aid times policy, significant.[12] Burnside and Dollar (1997) (which is the background paper from which the growth regressions in *Assessing Aid* are taken) construct a combined policy variable consisting of a variable proxiing for trade openness (*TRADE*), inflation (*INFL*) and the budget surplus (*BUDSURP*).[1314] We follow their approach. The first column in Table 7 presents the results when *TRADE, INFL* and *BUDSURP* are added to the base model. We used the coefficients for *TRADE, INFL* and *BUDSURP* as given in equation 1 of Table 7 to construct a combined policy index. In equation 2 of Table 7 we reestimate the base model with *AIDGNP* and *AIDGNP* interacted with the policy index (*POL*). We also ran regressions in which *AIDGNP* is only interacted with one of the policy variables. Results are given by equations 3 and 4 in Table 7. These results give a consistent picture: the policy variables *TRADE* and *INFL* are significant, in general *AIDGNP* is significant, but the interaction term with *AIDGNP* is never significant. Whilst *Assessing Aid* does find this interactive term to be significant, it is not found to be so here, neither is it in the model of Henrik and Tarp (1999), who attempted to replicate the *Assessing Aid* results, or in estimates for sub-Saharan Africa by White (1997). Hence the significant interactive policy term is a far from robust finding, and so, based on these results we do not interact *AIDGNP* with a policy index, or one of the policy variables, in the remainder of the paper.

After this short digression, we come back to the main issue of this paper and that is to examine whether there exists an aid Laffer curve. In order to do this we extend our base model with a quadratic term for *AIDGNP* (*AIDGNP2*). The results are given by equation 3 and 4 in Table 4. Equation 3 estimates the model for all observations. This equation gives an insignificant estimate for the quadratic term. However, again the residuals are not normally distributed. If we reestimate the equation by only taking into account the observations used for equation 2, the results indeed confirm the existence of an aid-Laffer curve (see equation 4). It should be noted, however, that the insignificance of the quadratic term for the model using all observations suggests that the result is quite sensitive to the countries included in the estimate.

The estimates presented in Table 4 may suffer from omitted variable bias since some relevant variables may not be taken into account. To test the reliability of the above results, the estimations as presented by equation 4 in Table 4 are extended by adding a group of domestic and international macroeconomic variables. The selection of the set of domestic and international macroeconomic variables - the *Z*-variables - is based on those identified by Sala-i-Martin (1997) as being important for economic growth. The following variables were included in the various models estimated:

1. Political variables: we consider an index for civil liberties (*CIVIL)* and index of political rights (*PRIGHTS)*.
2. In accordance with other recent studies (e.g. Burnside and Dollar, 1996), we include policy variables to measure market distortions. We used the black market premium (*BMP*), the inflation rate (*INFL*), the standard deviation of inflation (*STDINFL*) and the ratio of the budget surplus to GDP (*BUDSURP*).
3. Measure of Openness. We have included the trade to GDP ratio (*TRADE)*.
4. Financial development indicators. We include two proxies for financial development: the money and quasi money to GDP ratio (*MONGDP*) and credit to the private sector as % of GDP (*CREDITPR)*.
5. Capital flows. In the analysis we have also taken into account a linear and a quadratic term for total private capital flows (% of GDP) averaged over 5-year periods (*CAPFLO* and *CAPFLO2*).
6. We also consider the Life expectancy at birth (*LIFEE*), the primary enrolment rate (*PRENROLM*), the debt service ratio (*DEBTSERV*) and the mortality rate (*MORTAL*).

This means that in total 15 variables are included in the *Z* vector. In the regressions, all combinations of three of the above-presented set of 15 variables are taken into account. This implies that 455 estimates have been done. It also means that 15 independent variables are taken into account in all regressions.

The procedure of the EBA is as follows. For each regression *j*, we find an estimate β_{mj} and a standard deviation σ_{mj}. The lower extreme bound is the lowest value of $\beta_{mj} - 2\sigma_{mj}$, whereas the upper bound is $\beta_{mj} + 2\sigma_{mj}$. If the upper extreme bound for variable *M* is positive and the lower extreme bound is negative (*i.e.* the sign of the coefficient β_{mj} changes), then variable *M* is not robust. Results are presented in Table 8.

The above results show that according to the extreme bound analysis test, both the linear term for aid and the quadratic term is fragile in the two groups of estimates.

Sala-i-Martin (1997) criticizes the *EBA* analysis of Levine and Renelt (1992) for using too strict a test and presents an alternative stability analysis. His analysis comes down to looking at the entire distribution of the coefficient β, instead of a zero-one (robust-fragile) decision and calculating the fraction of the cumulative distribution function lying on each side of zero. By assuming that the distribution of the estimates of the coefficients is normal and calculating the mean and the standard deviation of

this distribution, the cumulative distribution function (*CDF*) can be calculated. His methodology starts by computing the point-estimates of β and the standard deviation σ. Next, the mean estimate of β and the average variance are calculated as:[15]

$$\overline{\beta_z} = \frac{\Sigma \beta_{zj}}{n} \qquad (18)$$

$$\overline{\sigma_z^2} = \frac{\Sigma \sigma_{zj}^2}{n} \qquad (19)$$

The mean estimate of β and the average standard error are the mean and the standard deviation of the assumed normal distribution. Finally, by using a table for the (cumulative) NORMAL distribution, it can be calculated which fraction of the cumulative distribution function is on the right or left hand side of zero. In Table 10 CDF denotes the Largest of the two areas. For this it does not matter whether this area is below or above zero.

Table 9 shows that the linear and quadratic term are robust according to this stability test. A closer look at the results per estimated equation shows that in more than 90 % of all regressions *AIDGNP* is significant at the 5% level, whereas the quadratic term is significant at the 5% level in only about 40 percent of all the regressions. Therefore, although our study suggests that an aid Laffer curve exists, and hence provides some empirical evidence for a negative effect of high aid inflows, the result is quite sensitive to the exact specification of the model.

If there are diminishing returns to aid, it is important to know the turning point, that is the aid to GNP ratio above which more aid has a negative marginal impact on growth. The turning-point can be calculated by dividing the linear term by minus two times the quadratic term. Based on the average coefficients for the entire set of estimates the turning point of the aid to GNP ratio is about 50%. Hence, although there are indeed indications of the existence of an aid Laffer curve, our study suggests that the turning point is high (although some countries do receive aid at such levels).[16] It is interesting to compare our results with the results of the few other studies considering a quadratic term for aid. The studies we are aware of are: Hadjimichael et al (1995), with an implied turning point of about 25%, Durbarry et al (1998) with an implied turning point of 51% and Hansen and Tarp (1999), with an implied turning point of 0.25!. The coefficients used by Collier and Dollar (1999) in their poverty-efficient reallocation of aid calculations would imply a turning point of 3.7 per cent. It should be taken into account that their estimate for the aid/GDP ratio uses PPP values for GDP, whereas we have scaled aid by normal dollar values of GDP. If we assume that, on average, the PPP value for GDP is 5 times the normal value of GDP,

their estimate for the turning point would be about 18.5%. This is much lower than the turning point implied by our study, as well as the studies by Hadjimichael et al (1995) and Durbarry et al (1998), but much higher than the implied turning point found by Hansen and Tarp (1999).

5. CONCLUSIONS

The World Bank report *Assessing Aid* assumes that aid is more effective when it is given to countries where polices are sound. Moreover, it assumes that an inflow of aid, above a certain level, starts to have negative effects. In this paper we empirically test both assumptions. We do not find evidence for the fact that aid becomes more effective when it is given to countries with good policies. On the other hand, we find some evidence for negative returns to aid at high levels of aid inflows. However, the results are sensitive to the countries considered as well as the exact specification. Moreover, the turning point above which aid starts to have a negative effect on growth seems to be much higher than assumed in the background calculations for *Assessing Aid.* We do not intend to argue that our estimate is the right one and that the estimates used by the World Bank are wrong. Rather, the main point is that results seem to be very sensitive to model specification and sample selection. Therefore, in our view, much more research is needed in order to develop a good base on which policy decisions can be made.

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Appendix 1 Countries in data set

Algeria	Kenya	Tanzania	Panama	Hong Kong	Cyprus
Angola	Lesotho	Togo	St. Lucia	India	Greece
Benin	Liberia	Tunisia	St. Vincent	Indonesia	Hungary
Botswana	Madagascar	Uganda	Trinidad	Iran	Malta
Burkina Faso	Malawi	Zaire	Argentina	Iraq	Poland
Burundi	Mali	Zambia	Bolivia	Israel	Fiji
Cameroon	Mauritania	Zimbabwe	Brazil	Jordan	PNG
Cape Verde	Mauritius	Bahamas, The	Chile	South Korea	Solomon Islands
CAR	Morocco	Barbados	Colombia	Kuwait	Tonga
Chad	Mozambique	Costa Rica	Ecuador	Malaysia	Vanuatu
Comoros	Niger	Dominica	Guyana	Nepal	Western Samoa
Congo	Nigeria	Dom. Republic	Paraguay	Oman	
Egypt	Rwanda	El Salvador	Peru	Pakistan	
Ethiopia	Senegal	Grenada	Suriname	Philippines	
Gabon	Seychelles	Guatemala	Uruguay	Saudi Arabia	
The Gambia	Sierra Leone	Haiti	Venezuela	Singapore	
Ghana	Somalia	Honduras	Afghanistan	Sri Lanka	
Guinea	South Africa	Jamaica	Bahrain	Syrian Arab Republic	
Guinea-Bissau	Sudan	Mexico	Bangladesh	Thailand	
Cote d'Ivoire	Swaziland	Nicaragua	China	United Arab Emirates	

Appendix 2 List of variables and sources

GDPPC	Real GDP per capita (1985 international prices) from Summers and Heston, the Penn World Tables (Mark 5.5 and Mark 5.6). Data for 1970-1989 (Mark 5.5) are taken from Barro and Lee (1994). Data for 1990-1992 (Mark 5.6) are taken from Penn World Tables, 1994. For estimation starting values for each 5 years' sub-period are used.
PCGROWTH	Per Capita Growth Rate of Real GDP. In the estimates, average growth rates over sub-periods of 5 years are used (except for the last period, which refers to 3 years). The growth rates are calculated from Real GDP per capita figures of the Summers and Heston (Penn World Table) datset. For sources see GDPPC.
PRIGHTS	Index of political rights (from 1 to 7; 1=most freedom). Taken from Barro and Lee (1994). The figures used refer to five year averages. Since latest data available refer to 1985-1990, we have lagged the variable with 5 years.
SENROLM	Gross enrolment ratio for secondary education. Taken from World Bank (1997).
CREDITPR	Credit to private sector (% of GDP). Taken from World Bank (1997).
DEBTGDP	Total external debt (% of GDP). Calculated by using figures for DEBT and GDP, both in current US$. Taken from World Bank (1997).
STDINFL	Standard deviation of inflation (calculated from GDP deflators) for each five years' sub-period. Inflation figures are taken from World Bank (1997)
CAPFLO	Total net private capital flows (% of GDP). The figures refer to averages for five years' sub-periods. Figures for total private capital flows and GDP (both denominated in current US$) are from World Bank (1997).

CAPFLO2	Squared value of CAPFLO
AIDGNP	Foreign aid (% of GNP). We have used starting values for each five years' sub-period. Taken from World Bank (1997)
AIDGNP2	Squared value of AIDGNP
TRADE	Trade (exports plus imports) (% of GDP). Taken from World Bank (1997)
INVGDP	Gross domestic investments (% of GDP). Taken from World Bank (1997).
DUM7579	Dummy for first five years' sub-period
DUM8084	Dummy for second five years' sub-period
DUM8589	Dummy for third five years' sub-period
DUM9094	Dummy for last five years' sub-period
DUMASIE	Dummy for Asian countries
DUMLA	Dummy for Latin American countries
DUMSSH	Dummy for Sub-Saharan African countries

Table 1 Aid levels classified by aid by per capita

	1975-79	1980-84	1985-89	1990-95
A/P>$250	New Caledonia (670), French Polynesia (641), Jordan (303), Antilles (270), Bahrain (264)	New Caledonia (1150), French Polynesia (1018),Bahrain (433), Netherlands Antilles (411), Jordan (397), Seychelles (273), Kiribati(258), Israel (254), Vanuatu (253)	New Caledonia (1487), French Polynesia (1457), Grenada (381), Israel (349), Seychelles (348), Netherlands Antilles (326), Cape Verde (276), Vanuatu (257)	New Caledonia (2090), French Polynesia (1614), Sao Tome and Principe (472), Netherlands Antilles (386), Micronesia (352), Cape Verde (321), Western Somoa (310), Tonga (304), Seychelles (294), Vanuatu (281), Israel (263), Kiribati (254)
A/P>$100	Suriname (225), Israel (219), Seychelles (218), Vanuatu (217), Dijbouti (198), Kiribati (129), Western Somoa (126), Oman (1998), Mauritania (116), Syria (112), Solomon Islands (107), Malta (106), Tonga (104), Belize (100)	Dijbouti (225), Dominica (207), Cape Verde (198), Tonga (180), Suriname (161), Western Somoa (153), Solomon Islands (123), Syria (123), Comoros (119), Mauritania (114), Oman (113), Botswana (106), Papua New Guinea(101)	Kiribati (228), Dominica (224), Dijbouti (220), St Kitts and Nevis (209), Sao Tome and Principe (205), Tonga (202), Western Somoa (176), Jordan (169), Solomon Islands (146), Belize (140), Comoros (122), St. Vincent (119), Equatorial Guinea (116), Botswana (114), Mauritania (113), Gabon (108), The Gambia (105), Maldives (100)	Dijbouti (236), Dominica (224), St. Lucia (174), St Kitts and Nevis (165), Suriname (165), St. Vincent (165), Jordan (159), Grenada (151), Maldives (148), Nicaragua (141), Bahrain (138), Equatorial Guinea (137), Guyana (137), Solomon Islands (131), Gabon (127), Belize (124), Guinea-Bissau (123), Zambia (118), Mauritania (116), Namibia (107), Comoros (106)
A/P>$50	Papua New Guinea (96) Dominica (93), Cape Verde (91), Cyprus (86), Botswana (77), Gabon (64), Swaziland (59), Antigua and Barbuda (56) Egypt (55), Sao Tome and Principe (52), St. Vincent (52), Guinea-Bissau (52)	Belize (87), St Kitts and Nevis (87), Sao Tome and Principe(86), Gabon (82) Antigua and Barbuda (81), Malta (81), The Gambia (78), Lebanon (75), Guinea-Bissau (74), Jamaica (74), St. Vincent (72), Lesotho (69), Maldives (68), St. Lucia (62), Swaziland (60), Barbados (57), Liberia (56), Senegal (56), Somalia (55), Yemen (55), Costa Rica (54), Fiji (54), Congo (53) Guyana (52), Cyprus (52), Grenada (51)	Guinea-Bissau (99), St. Lucia (91), Papua New Guinea (87), Antigua and Barbuda (84), Jamaica (83), El Salvador (81), Costa Rica (80), Senegal (80), Bahrain (77), Bhutan (67), Lesotho (64), Honduras (60), Central African Republic (59), Suriname (58), Cyprus (58), Fiji (58), Zambia (58), Somalia (56), Bolivia (54), Mauritius (52), Mali (51)	Bhutan (98), Papua New Guinea (93), Botswana (88), The Gambia (86), Bolivia (86), Yugoslavia (84), Senegal (83), Mozambique (78), Congo (73), Cote d'Ivoire (71), Lesotho (70), Albania (69), Rwanda (68), Fiji (67), Antigua and Barbuda (67), Honduras (66), El Salvador (65), Egypt (65), Swaziland (64), Guinea (62), Jamaica (60), Central African Republic (60), Somalia (57), Malawi (55), Benin (53), Poland (52), Mongolia (51), Mali (50)
Source: World Bank *World Development Indicators 1997*				

Table 2 Aid levels classified by ratio of aid to GNP

	1975-79	1980-84	1985-89	1990-95
A/Y> 0.5	-	Cape Verde (57), Somalia (56)	Guinea-Bissau (57), Cape Verde (56), Somalia (50)	Sao Tome and Principe (132), Mozambique (98), Somalia (59), Guinea-Bissau (52)
A/Y> 0.3	Cape Verde (41), Vanuatu (38), Solomon Islands (35), Mauritania (33), Guinea-Bissau (33)	Guinea-Bissau (44), Comoros (37), Kiribati (36), Vanuatu (32)	Mozambique (48), Sao Tome and Principe (48), The Gambia (39), Equatorial Guinea (37), Kiribati (33)	Nicaragua (43), Equatorial Guinea (38), Cape Verde (37), Guyana (37), Rwanda (36), Western Somoa (31), Zambia (30), Kiribati (30)
A/Y> 0.2	Somalia (29), Comoros (28), Kiribati (20)	The Gambia (28), Mauritania (26), Tonga (26), Sao Tome and Principe (25), Solomon Islands (25), Western Somoa (22), Dominica (22), Mali (20)	Comoros (29), Vanuatu (28), Mauritania (27), Chad (26), Western Somoa (25), Mali (25), Solomon Islands (24), Maldives (23), Malawi (22), Tonga (21)	Malawi (29), Tanzania (29), Dijbouti (26), The Gambia (25), Mauritania (25), Vanuatu (25), Burundi (25), Bhutan (24), Sierra Leone (23), Marshall Islands (23), Micronesia (23), Chad (22), Albania (21), Tonga (20)
Source: World Bank *World Development Indicators 1997*				

Table 3(a) Cumulative distributions of aid per capita and aid as a per cent of GNP

	1975-79	1980-84	1985-89	1990-92
Aid per capita				
A/P > $50	31	47	47	60
A/P > $100	19	21	26	32
A/P > $250	5	9	8	12
Aid as a per cent of GNP				
A/Y > 20 %	8	14	18	26
A/Y > 30 %	5	6	8	12
A/Y > 50 %	0	2	3	4

Source: World Bank World Development Indicators 1997

Table 3(b) Summary statistics of aid per capita and aid as a per cent of GNP

	1975-79	1980-84	1985-89	1990-92
Aid per capita				
Lower quartile	2.0	1.8	2.4	10.5
Median	11.0	19.2	22.5	38.3
Upper quartile	34.5	55.5	58.3	79.5
Inter-quartile range	32.5	53.7	55.9	69
n	152	160	159	162
Aid as a per cent of GNP				
Lower quartile	0.7	0.6	0.1	0.6
Median	3.8	4.9	3.3	4.0
Upper quartile	10.6	10.2	10.6	16.2
Inter-quartile range	9.9	9.6	10.5	15.6
n	109	126	148	152

Source: World Bank World Development Indicators 1997

Table 4 Base model and Laffer curve estimates

	(1)	(2)	(3)	(4)
GDPPC	-0.000311 (-2.63)	-0.00023 (-1.97)	-0.00030 (-2.43)	-0.00020 (-1.74)
SECENROL	0.0305 (2.39)	0.0280 (2.17)	0.0318 (2.45)	0.0310 (2.37)
DEBTGDP	-0.0214 (-3.72)	-0.0195 (-3.32)	-0.021 (-3.71)	-0.021 (-3.45)
DUM7579	2.3589 (3.00)	2.3212 (3.07)	2.116 (2.48)	1.851 (2.30)
DUM8084	-0.5468 (-0.67)	-0.8590 (-1.08)	-0.812 (-0.88)	-1.327 (-1.58)
DUM8589	1.7977 (1.80)	1.2224 (1.40)	1.524 (1.36)	0.7533 (0.83)
DUM9094	1.1186 (1.08)	0.8884 (0.92)	0.836 (0.74)	0.3482 (0.34)
DUMA	-1.0574 (-1.58)	-0.8876 (-1.37)	-1.073 (-1.60)	-0.906 (-1.39)
DUMLA	-0.0324 (-0.06)	-0.1053 (-0.19)	0.034 (0.06	0.0536 (0.10)
DUMASIE	2.0796 (2.89)	2.7042 (4.87)	2.169 (2.16)	2.870 (5.03)
AIDGNP	0.0758 (3.22)	0.0775 (3.45)	0.108 (2.16)	0.1466 (2.98)
AIDGNP2			-0.0005 (-0.79)	-0.0013 (-1.82)
Adj. R^2	0.22	0.31	0.22	0.31
SSR	3468.339	2357.714	3463.39	2339.161
SDDV	3.943	3.5678	3.943	3.5678
MDP	0.766	0.8405	0.766	0.8405
JB	104.33	3.58	111.13	3.53
Obs.	296	278	296	278

Notes: SSR= Sum squared residuals; SDDV is standard deviation dependent variable; MDP is mean dependent variable; JB = Jarque-Bera test statistic; Obs. = amunt of observations. The estimates are done with white heteroscedastic consistent standard errors. This applies to all tables.

Table 5 Determination of instruments: dependent variable *AIDGNPS*

	Inst 1	Inst 2	Inst 3
GDPPC	-0.00017 (-0.73)	-0.00064 (-1.72)	-0.00021 (-0.87)
SECENROL	-0.1295 (-3.09)	-0.1563 (-3.42)	-0.1287 (-3.07)
DEBTGDP	0.0486 (2.66)	0.1036 (3.45)	0.0485 (2.66)
DUM7579	10.499 (2.38)	17.389 (3.48)	10.591 (2.39)
DUM8084	12.660 (2.59)	20.247 (3.62)	12.696 (2.59)
DUM8589	11.422 (2.31)	18.430 (3.44)	11.186 (2.26)
DUM9094	11.596 (2.49)	18.320 (3.64)	11.478 (2.45)
DUMA	1.633 (0.93)	-0.199 (-0.11)	1.550 (0.88)
DUMLA	-4.746 (-3.60)	-4.571 (-3.23)	-4.747 (-3.58)
DUMASIE	-2.905 (-2.22)	-3.852 (-2.53)	-3.310 (-2.51)
POP	-4.23E-09 (-2.86)	-5.27E-09 (-3.53)	-4.41E-09 (-2.76)
MORTAL	-0.012 (-0.43)	-0.047 (-1.49)	-0.008 (-0.29)
CIVIL	-0.018 (-0.04)	-0.051 (-0.12)	0.811 (1.16)
DEBTSERV		-0.856 (-3.69)	
PRIGHTS			-0.819 (-1.90)
Adj. R^2	0.33	0.40	0.33
Obs.	278	254	278

Table 6 Estimate with instruments: dependent variable *PCGROWTH*

	Inst 1	Inst 2	Inst 3
GDPPC	-0.00020 (-1.74)	-2.85E-05 (-0.14)	-0.00021 (-1.85)
SECENROL	0.0697 (1.79)	0.0212 (1.15)	0.0531 (1.93)
DEBTGDP	-0.0370 (-2.19)	-0.0221 (-3.19)	-0.0300 (-2.34)
DUM7579	-0.7583 (-0.27)	1.9758 (1.80)	0.4711 (0.24)
DUM8084	-4.6854 (-1.35)	-1.4459 (-1.15)	-3.1579 (-1.29)
DUM8589	-2.1835 (-0.71)	0.9845 (0.80)	-0.8238 (-0.38)
DUM9094	-2.5928 (-0.82)	0.5082 (0.38)	-1.2030 (-0.53)
DUMA	-1.4682 (-1.82)	-1.2173 (-1.79)	-1.2364 (-1.76)
DUMLA	1.5315 (0.98)	-0.1008 (-0.14)	0.8781 (0.75)
DUMASIE	3.9299 (3.44)	2.6207 (3.73)	3.4405 (3.78)
AIDGNP	0.0752 (3.36)	0.0624 (2.53)	0.0747 (3.33)
FITAIDGNP	0.3563 (1.14)	0.0809 (0.94)	0.2155 (0.99)
Adj. R^2	0.31	0.28	0.31
Obs.	278	254	278

Table 7 Estimates with policy interactive term

	(1)	(2)	(3)	(4)
GDPPC	-0.000464 (-4.01)	-0.00043 (-3.76)	-0.00025 (-2.20)	-0.00034 (-3.01)
SECENROL	0.0174 (1.41)	0.0261 (2.04)	0.0298 (2.29)	0.0226 (1.78)
DEBTGDP	-0.0288 (-3.81)	-0.0320 (-4.35)	-0.0204 (-3.35)	-0.0216 (-3.72)
DUM7579	3.6295 (4.55)	2.9511 (3.57)	2.3275 (3.05)	2.0664 (2.69)
DUM8084	1.0230 (1.21)	0.2639 (0.30)	-0.8192 (-1.02)	-0.9762 (-1.21)
DUM8589	3.5132 (3.77)	2.7818 (2.97)	1.3402 (1.49)	1.2504 (1.40)
DUM9094	2.9143 (2.84)	2.0829 (1.91)	1.0998 (1.11)	0.8893 (0.89)
DUMA	-1.4422 (-2.11)	-1.4010 (-1.99)	-0.8605 (-1.32)	-1.1950 (-1.83)
DUMLA	-0.1846 (-0.30)	0.1683 (0.27)	0.1239 (0.21)	0.0500 (0.09)
DUMASIE	1.4372 (2.49)	1.7979 (2.91)	2.6497 (4.75)	2.3888 (4.24)
INFL	-0.0023 (-3.00)	-0.0022 (-2.85)	-0.0026 (-2.95)	
BUDSURP	0.0738 (1.33)	0.0113 (3.12)		
TRADE	0.0134 (3.51)	0.0858 (1.37)		0.0131 (3.43)
AIDGNPS		0.0929 (2.34)	0.0741 (2.96)	0.0830 (1.52)
AIDGNP*POL		-0.0119 (-0.29)		
AIDGNP*INFL			0.0001 (0.20)	
AIDGNP*TRADE				-0.0002 (-0.41)
Adj. R^2	0.36	0.37	0.31	0.32
Obs.	237	237	278	278

Table 8 Extreme Bounds Analysis

Variable	β	SE	t-value	R^2	AV	Robust/ Fragile
AIDGNP	high: 0.4552	0.086	3.32	0.36	BUDDEF, CREDITPR, DEBTSERV	
	low: -0.0402	0.080	1.50	0.38	BUDDEF, TRADE, MONGDP	Fragile
AIDGNP2	high: 0.0052	0.0026	0.00	0.38	BUDDEF, PRIGHTS, BMPLAG	
	low: -0.0094	0.0022	-2.27	0.40	BUDDEF, CAPFLO, MORTAL	Fragile

Note: AV= additional variables, SE= standard error. Row 2 and 3 refer to estimates for which *INVGDP* is not included in *I* vector. Row 5 and 6 present the results for estimates where *INVGDP* is included. Note that the amount of observations are not exactly the same in the different estimates due to lacking data. The amount of observations varies between 250 and 278.

Table 9 An Alternative Stability Test

Variable	R^2	β	σ	CDF	Perc
AIDGNP	0.36	0.1736	0.05729	0.999	0.96
AIDGNP2	0.36	-0.00175	0.001014	0.958	0.39

Note: perc denotes the percentage of regressions that variable is significant at 5% level.

Notes

[1] These data are of course in nominal terms. However, IMF data show that the dollar-based import price index for the developing countries (the most appropriate deflator for aid flows from their point of view) to have risen by only ten to twenty per cent over this period.

[2] In Lensink and White (1999) a simple endogenous growth model is presented which incorporates an aid Laffer curve.

[3] Several agencies couch this objective in terms of gender, although their actual concerns are linked to women's position rather than gender *per se*.

[4] Our story does not distinguish types of aid. It is of course clear that some types of aid, notably debt relief, require rather less management capacity than others. Though even debt relief has associated Consultative Group meetings to prepare for and attend and donor monitoring and evaluation requirements to satisfy.

[5] The number of observations for the regressions is less than 4 times the number of countries on account of the absence of data for some countries.

[6] Many studies use the log of the initial value for GDP per capita. We have used the normal value of GDP per capita since that gave somewhat better results in terms of significance.

[7] Some have argued (e.g. Krugman, 1994) that the success of the East Asian economies can be accounted for by factor inputs alone. Hence if these variables are included then the dummy variables may not be significant.

[8] Under the null hypothesis of normality this test is chi-squared distributed with two degrees of freedom. It should be lower than 5.99 to be significant at the five per cent level.

[9] We also tried other instruments as well, including the donor dummy used by Boone. For reasons of space, and because of the fact that they were not significant we have not presented them.

[10] This is a version of the Hausman test for endogeneity (see Mukherjee *et al*., 1998).

[11] It was indeed argued long ago by Mosley (1980) that it is unlikely that aid is endogenous with respect to growth (rather than the level of income).

[12] An extended discussion of *Assessing Aid* may be found in Lensink and White (2000b).

[13] Note that Burnside and Dollar use another proxy for trade openness and that their specification is different.

[14] We also tested the product of the policy variable with the square of aid (which is the form used by Burnside and Dollar), but again found insignificant results.

[15] Sala-i-Martin uses a weigthed average with the likelihoods as weights. He shows that results of his empirical analysis do not differ very much when an unweighted average is used.

[16] Since only a few countries in our data set have Aid to GDP ratios above 50% , and hence only a few countries pick up the downward part of the Laffer curve, it might be argued that our study primarily gives evidence for diminishing, but not negative, returns to aid.